A CONTRIBUTION TO THE KNOWLEDGE OF CYTOLOGY IN MAGNOLIALES

PETER GOLDBLATT

RECENT INTEREST IN THE PHYLOGENY of the primitive angiosperms has resulted in the addition of considerable cytological data on the group (Raven & Kyhos, 1965; Ehrendorfer *et al.*, 1968; Raven, Kyhos & Cave, 1971). Nevertheless the cytology of two families, the Trimeniaceae and Gomortegaceae (Raven, 1974), has remained unknown and represents an important gap in our knowledge. The cytology of one species of the Trimeniaceae, *Trimenia papuana*, $2n = 16$, is described here as well as that for two other species, *Hortonia floribunda*, $2n = 38$ (Monimiaceae) [1] and *Austrobaileya cf. scandens*, $2n = 44$ (Austrobaileyaceae). While the chromosome count for *Hortonia* is the first report for this genus, the count for *Austrobaileya* cf. *scandens* is a confirmation of a previous count of $2n = 44$ for this plant published by Rüdenberg (1967) in this journal. A later record of $2n = 46$ for this species (Ehrendorfer *et al.*, 1968) which threw doubt on Rüdenberg's report must be viewed with misgiving.

MATERIALS AND METHODS

Mitotic counts were made from root tips of seedlings grown from seed collected in the wild in the case of *Trimenia* and *Hortonia*, while root tip material was obtained from *Austrobaileya cf. scandens* from a cutting of the same material originally studied by Rüdenberg. Root tips were pretreated on 0.1 per cent colchicine for five hours at ± 4°C., fixed in acetic: ethanol, 1:3, for three minutes, and then stored in 70 per cent ethanol. Root tips were hydrolized in 10 per cent HCl at 60°C. and then squashed in lacto-propionic orcein (Dyer, 1963).

OBSERVATIONS

1. TRIMENIACEAE
   Trimenia papuana Ridley, $2n = 16$, Mount Kaindi, Wau, New Guinea, *P. Katik 56376.*
2. MONIMIACEAE
   Hortonia floribunda Wight, $2n = 38$, Kruikles, 800 m., Ceylon, *Koster-mans s.n.*
3. AUSTROBAILEYACEAE
   Austrobaileya cf. scandens C. T. White, $2n = 44$, Australia, Queensland, near Ravenshoe, *Webb & Tracy 6301.*

The record for *Trimenia papuana* represents the first count for the family Trimeniaceae. Chromosomes of this species are of medium size

[1] Recently Smith (1971) proposed the segregation of *Hortonia* in Hortoniaceae.

FIGURE 1. A, Chromosomes of *Trimenia papuana* Ridley, $2n = 16$; B, *Hortonia floribunda* Wight, $2n = 38$.

(FIGURE 1A), ranging from 2.5–3.5 μm. in length, and though they are somewhat smaller than those of *Austrobaileya*, as described and illustrated by Rüdenberg, they are of the same order. The karyotype of *Trimenia papuana* is, however, far more simple and comprises eight pairs of similarly sized submetacentric chromosomes.

The chromosomes of *Hortonia* are very small and although they range in size from about 3.0 to less than 1.8 μm. the mean size is only about 2 μm. (FIGURE 1B). Considerable difficulty was experienced in establishing the chromosome number with certainty as there are a pair of extremely large satellites on the longest pair of chromosomes, and in all but the best preparations a higher chromosome count was obtained.

The count of $2n = 44$ for *Austrobaileya* and every aspect of the karyotype reported by Rüdenberg is verified here. Of particular note in the karyotype are the two long pairs of chromosomes, the smaller of which bears a very large satellite. The conflicting count of $2n = 46$ by Ehrendorfer *et al.* (1968) cannot be explained, though it should be noted that the material examined by Rüdenberg is in fact from the same stock as that studied here.

DISCUSSION

The basic number of $x = 8$ found in *Trimenia* is remarkable for the Magnoliales, where much higher basic numbers are common, and the only other group with diploids is the distantly related Annonaceae (Raven, 1974). It is even more unusual in the group of families sometimes separated from the Magnoliales in the order Laurales (Takhtajan, 1969; Smith, 1971), and *Trimenia* stands out as the only diploid in this alliance. The cytology fully supports the segregation of Trimeniaceae from the Monimiaceae as proposed by Money, Bailey, and Swamy (1950) on the basis of morphological and anatomical differences. The cytological infor-

TABLE 1. **Chromosome numbers in Monimiaceae s.s.** (sensu Schodde, 1970).

SPECIES	CHROMOSOME NO. *n* (HAPLOID)	AUTHOR
PEUMOIDEAE		
Peumus boldus Mol.	39	Tschischow, 1956
MONIMIOIDEAE		
Kibara sp.	22	Borgmann, 1964
Tetrasynandra sp.	ca. 43	Ehrendorfer *et al.*, 1968
Hedycarya arborea Forst.	57	Hair & Beuzenberg, 1959
Hedycarya angustifolia R. Cunn.	19	Ehrendorfer *et al.*, 1968
Hedycarya loxocarya (Benth.) Francis	19	" " "
Hedycarya sp. 1	19	" " "
Hedycarya sp. 2	19	" " "
Levieria acuminata (F. V. Muell.) Park	19, ca. 19	" " "
Palmeria scandens F. V. Muell.	19, ca. 19	" " "
Palmeria sp.	ca. 19	" " "
Wilkiea macooraia (Baill.) Perk.	ca. 38	" " "
Mollinedia blumenavii Perk.	18	Gadella *et al.*, 1969
HORTONIOIDEAE		
Hortonia floribunda Wight	19	Goldblatt

mation would in fact suggest that this family is even more distinct than previously supposed, and cytological data for other species of *Trimenia* and especially of *Piptocalyx*, the only other genus in the Trimeniaceae, are eagerly sought.

The family Monimiaceae is comparatively well known cytologically. Work by Hair and Beuzenberg (1959) and by Ehrendorfer *et al.* (1968) has indicated a base number of $x = 19$ in nine species of four different genera of Monimioideae (TABLE 1). There are, however, other base numbers indicated even within Monimioideae sensu Money, Bailey, and Swamy: Borgman (1964) reported $2n = 44$ in *Kibara* sp.; Ehrendorfer *et al.* (1968) found $2n = \pm 86$ in *Tetrasynandra* sp.: and Gadella *et al.* (1969) obtained $2n = 36$ in *Mollinedia blumenavii*. *Peumus boldus*, believed to be only distantly allied to the main group of Monimioideae and placed in a separate subfamily (Schodde, 1970), has $2n = 78$ (Tschischow, 1956). It should also be noted that the two subfamilies of Monimiaceae, Atherospermatoideae and Siparunoideae, recently segregated as two distinct families (Schodde, 1970), both differ in their cytology from the bulk of the Monimiaceae with $x = 22$ in all species examined to date.

The chromosome number of $2n = 38$ for *Hortonia floribunda* is thus consistent with the majority of chromosome numbers known for the Monimiaceae — Monimioideae. The chromosomes of *Hortonia* are similar to those of Monimiaceae in size as far as this can be gauged from a photograph published by Hair and Beuzenberg (1959) for one species of Monimiaceae.

Unfortunately, although many other representatives of the Monimiaceae are known cytologically, no other report or illustration of chromosome size in the family is known. It is disappointing to note that in spite of the large number of chromosome counts that are known for the Magnoliales, there are very few instances where other characters of the karyotype are described. The author would like to make a general plea that cytologists recording chromosome number at least make some mention of general chromosome size if they do not give the size range and indication of method used in preparation. In this way, additional karyotypic information can be made available with very little effort.

If the chromosome size figured by Hair and Beuzenberg is consistent in the Monimiaceae, then both base number and size strongly link *Hortonia* with this family. This does not add weight to Smith's (1971) segregation of Hortoniaceae, while Money, Bailey, and Swamy's (1950) conclusion that *Hortonia* resembles the Monimioideae in many ways and that it is much more closely related to this family than *Trimenia* or *Piptocalyx* is clearly supported by the cytological evidence. On the other hand, information now known for *Trimenia* supports the segregation of this genus in a distinct family. Chromosome number alone might be seen to be consistent with suggestions that the Austrobaileyaceae is related to the Lauralean group of families. However, the great difference in size observed between *Austrobaileya* and the few representatives of the Monimiaceae where this character is known suggests that the relationship between these two families is not particularly close. Since $x = 7$ is accepted as the original base number for the Magnoliales, the Trimeniaceae would appear to be an ancient diploid and to be one of the few extant primitive diploid woody angiosperms. *Hortonia* is probably of palaeohexaploid origin.

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MISSOURI BOTANICAL GARDEN
2315 TOWER GROVE AVENUE
ST. LOUIS, MISSOURI 63110